

Master of Science (M. Sc.)
Photovoltaics Engineering Science
at Anhalt University of Applied Sciences

- International Master program in English language (English skills of level B.2 or equivalent required)
- 3 semesters (90 credits), start in winter or summer semester; first enrolments for start October 2016
- 2 semesters courses in photovoltaics related subjects, 1 semester Master thesis by research work
- Master thesis in Fraunhofer Center for Silicon Photovoltaics CSP (in nearby city Halle), PV lab of Anhalt University or any other PV laboratory or any PV company
- Bachelor degree in Engineering Science or Physics required (at least 210 credits or 7 semesters)
- Target job profile: engineer in research & development (R&D), design, construction, operation or management of PV power plants
- Attendance fee of 1050,- € per semester
- For questions contact Prof. Dr. J. Bagdahn (joerg.badgahn@hs-anhalt.de) or Prof. Dr. N. Bernhard (norbert.bernhard@hs-anhalt.de)

Overview of Curriculum

Photovoltaics Engineering Science (M. Sc.)

Semester	Credits (\approx Tuition Hours per Week)																												
	1				5					10					15					20					25				
1.	Physics of the Solar Cell				Crystalline Silicon Solar Cells				Thin Film Solar Cells				Cell and Materials Diagnostics				Solar System Applications				German Language								
2.	Solar Modules and Components				System and Component Reliability				System Design, Monitoring, Yield and Performance Analysis, Markets				Storage Systems				Electric Grids, Solar Energy Integration				Business Studies								
3.	Master Thesis																												

	Credits	Share
Modules directly related to solar energy engineering	50	56%
Soft Skills	10	11%
Master thesis	30	33%
	90	100%

The winter semester starts in October, the summer semester in April.

15 weeks of tuition are followed by 2 weeks of examinations. A second examination period of 2 weeks follows directly before the next tuition period.

Details are regulated in the study and examination plan of Anhalt University of Applied Sciences.

If a student decides to start in the summer semester, the modules of the above indicated 2nd semester will be taken before those of the 1st semester (semester sequence will then be 2-1-3)

Assignment of a specific subject to the first or second semester can change, but in total every semester has to contain 6 subjects.

In case of a change of assignment, it must be assured that students who started in winter or summer semester can embark in all courses.

Content of the Courses

Courses of winter semester

Course	Content	Lecturer (preliminary)	Credits
Physics of the Solar Cell	pn-junction, carrier transport, generation and recombination, diode equation under illumination	Prof. Bernhard	5
Crystalline Silicon Solar Cells	Silicon + cell, scientific fundamentals and manufacturing technologies	Prof. Bernhard / Prof. Bagdahn	5
Thin Film Solar Cells	Thin film deposition technologies and thin film solar cells (a-Si, μ -Si, CdTe, CIGS, organic)	Prof. Zscheyge / Prof. Bernhard	5
Cell and Material Diagnostics	Material analysis and microstructure, electrical parameters (I-V, carrier life time, ..), mechanical analysis	Prof. Fütting / Dr. Hagendorf	5
Solar System Applications	Overview over solar system applications, components of solar systems	Prof. Bergmann	5
German language	Fundamentals of the German language (usually beginner level); for native or advanced German speakers an alternative language or other subject of soft skills can be elected	tbd	5
			30

Courses of summer semester

Course	Content	Lecturer (preliminary)	Credits
Solar Modules and Components	Module types (c-Si, TF, CPV), Design, Production, Materials (polymers, interconnects, glass, ARC) and components (J-box, cable, ..), Characterization methods (I-V, EL, Thermography, ..), Inverter	Prof. Bernhard / Prof. Schneider	5
System and Component Reliability	PV module test standards, Reliability investigation (cells, interconnects, polymer, frame, PID, ...)	Prof. Bagdahn / Dr. Ebert	5
System Design, Monitoring, Yield and Performance Analysis, Markets	PV systems design (setup test system), Yield calculation (software), Monitoring systems, Performance analysis	tbd	5
Storage systems	Batteries (lead, lithium, future systems), battery control, alternative storage systems (hydrogen, methane, electrolysis, pumped storage water station)	Prof. Bergmann	5
Electric Grids, Solar Energy Integration	Overview over electric grid, integration of solar electricity in the various segments (high, medium, low voltage), smart grids	tbd	5
Business studies	Fundamentals of business administration	tbd	5
			30

Final research semester:

Course	Content	Supervisor	Credits
Master Thesis	Scientific research in the field of photovoltaics engineering science	To be elected according to the topic of master thesis	30